(iii) Provisions shall be incorporated in the assembly to hold the containers firmly in position and prevent their movement during transit.

(iv) Containers shall be mounted on a substantial support or a base secured firmly to the vehicle chassis. Neither the container nor its support shall extend below the manufactured home frame.

(c) *Oil tanks*—(1) *Installation.* Oil tanks and listed automatic pumps (oil lifters) installed for gravity flow of oil to heating equipment shall be installed so that the top of the tank is no higher than 8 feet above the appliance oil control and the bottom of the tank is not less than 18 inches above the appliance oil control.

(2) *Auxiliary oil storage tank.* Oil supply tanks affixed to a manufactured home shall be so located as to require filling and draining from the outside and shall be in a place readily available for inspection. If the fuel supply tank is located in a compartment of a manufactured home, the compartment shall be ventilated at the bottom to permit diffusion of vapors and shall be insulated from the structural members of the body. Tanks so installed shall be provided with an outside fill and vent pipe and an approved liquid level gage.

(3) *Shutoff valve.* A readily accessible, approved manual shutoff valve shall be installed at the outlet of an oil supply tank. The valve shall be installed to close against the supply.

(4) *Fuel oil filters.* All oil tanks shall be equipped with an approved oil filter or strainer located downstream from the tank shutoff valve. The fuel oil filter or strainer shall contain a sump with a drain for the entrapment of water.

[40 FR 58752, Dec. 18, 1975. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 47 FR 49390, Nov. 1, 1982; 52 FR 4587, Feb. 12, 1987; 58 FR 55016, Oct. 25, 1993; 70 FR 72050, Nov. 30, 2005]

EFFECTIVE DATE NOTE: At 78 FR 73987, Dec. 9, 2013, § 3280.704 was removed and reserved, effective June 6, 2014.

§ 3280.705 Gas piping systems.

(a) *General.* The requirements of this section shall govern the installation of all fuel gas piping attached to any manufactured home. The gas piping supply system shall be designed for a pressure not exceeding 14 inch water column (½ psi) and not less than 7 inch water column (¼ psi). The manufacturer shall indicate in his written installation instructions the design pressure limitations for safe and effective operation of the gas piping system. None of the requirements listed in this section shall apply to the piping supplied as a part of an appliance. All exterior openings around piping, ducts, plenums or vents shall be sealed to resist the entrance of rodents.

(b) *Materials.* All materials used for the installation, extension, alteration, or repair of any gas piping system shall be new and free from defects or internal obstructions. It shall not be permissible to repair defects in gas piping or fittings. Inferior or defective materials shall be removed and replaced with acceptable material. The system shall be made of materials having a melting point of not less than 1,450 F, except as provided in § 3280.705(e). They shall consist of one or more of the materials described in § 3280.705(b) (1) through (4).

(1) Steel or wrought-iron pipe shall comply with ANSI Standard B36.10–1979, Welded and Seamless Wrought Steel Pipe. Threaded brass pipe in iron pipe sizes may be used. Threaded brass pipe shall comply with ASTM B43–91, Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

(2) Fittings for gas piping shall be wrought iron, malleable iron, steel, or brass (containing not more than 75 percent copper).

(3) Copper tubing must be annealed type, Grade K or L, conforming to the Standard Specification for Seamless Copper Water Tube, ASTM B88–93, or must comply with the Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Service, ASTM B280–1995. Copper tubing must be internally tinned.

(4) Steel tubing must have a minimum wall thickness of 0.032 inch for tubing of ½ inch diameter and smaller and 0.049 inch for diameters ½ inch and larger. Steel tubing must be in accordance with ASTM Standard Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas and Fuel

Oil Lines, ASTM A539–1999, and must be externally corrosion protected.

(c) *Piping design.* Each manufactured home requiring fuel gas for any purpose shall be equipped with a natural gas piping system acceptable for LP-gas. Where fuel gas piping is to be installed in more than one section of an expandable or multiple unit home, the design and construction of the crossover(s) shall be as follows:

(1) All points of crossover shall be readily accessible from the exterior of the home.

(2) The connection(s) between units must be made with a connector(s) listed for exterior use or direct plumbing sized in accordance with § 3280.705(d). A shutoff valve of the non-displaceable rotor type conforming to ANSI Z21.15–1997, Manually Operated Gas Valves for Appliances, Appliances Connector Valves, and Hose End Valves, suitable for outdoor use must be installed at each crossover point upstream of the connection.

(3) The connection(s) may be made by a listed quick disconnect device which shall be designed to provide a positive seal of the supply side of the gas system when such device is separated.

(4) The flexible connector, direct plumbing pipe, or ''quick disconnect'' device shall be provided with protection from mechanical and impact damage and located to minimize the possibility of tampering.

(5) For gas line cross over connections made with either hard pipe or flexible connectors, the crossover point(s) shall be capped on the supply side to provide a positive seal and covered on the other side with a suitable protective covering.

(6) Suitable protective coverings for the connection device(s) when separated, shall be permanently attached to the device or flexible connector.

(7) When a quick disconnect device is installed, a 3 inch by 1¾ inch minimum size tag made of etched, metal-stamped or embossed brass, stainless steel, anodized or alcalde aluminum not less than 0.020 inch thick or other approved material (e.g., 0.005 inch plastic laminates) shall be permanently attached on the exterior wall adjacent to the access to the ''quick disconnect'' device. Each tag shall be legibly inscribed with the following information using letters no smaller than ¼ inch high:

Do Not Use Tools To Separate the ''Quick-Disconnect'' Device

(d) *Gas pipe sizing.* Gas piping systems shall be sized so that the pressure drop to any appliance inlet connection from any gas supply connection, when all appliances are in operation at maximum capacity, is not more than 0.5 inch water column as determined on the basis of test, or in accordance with table 3280.705(d). When determining gas pipe sizing in the table, gas shall be assumed to have a specific gravity of 0.65 and rated at 1000 B.T.U. per cubic foot. The natural gas supply connection(s) shall be not less than the size of the gas piping but shall be not smaller than ¾ inch nominal pipe size.

(e) *Joints for gas pipe.* All pipe joints in the piping system, unless welded or brazed, shall be threaded joints that comply with Pipe Threads, General Purpose (Inch), adopted 25 October 1984, ANSI/ASME B1.20.1–1983. Right and left nipples or couplings shall not be used. Unions, if used, shall be of ground joint type. The material used for welding or brazing pipe connections shall have a melting temperature in excess of 1,000 F.

(f) *Joints for tubing.* (1) Tubing joints shall be made with either a single or a double flare of 45 degrees in accordance with Flares For Tubing, SAE-J533b-1972 or with other listed vibration-resistant fittings, or joints may be brazed with material having a melting point exceeding 1,000 F. Metallic ball sleeve compression-type tubing fittings shall not be used.

(2) Steel tubing joints shall be made with a double-flare in accordance with Flares For Tubing, SAE-J533b-1972.

(g) *Pipe joint compound.* Screw joints shall be made up tight with listed pipe joint compound, insoluble in liquefied petroleum gas, and shall be applied to the male threads only.

(h) *Concealed tubing.* Tubing shall not be run inside walls, floors, partitions, or roofs. Where tubing passes through walls, floors, partitions, roofs, or similar installations, such tubing shall be protected by the use of weather resistant grommets that shall snugly fit

both the tubing and the hole through which the tubing passes.

PART I—MAXIMUM CAPACITY OF DIFFERENT SIZES OF PIPE AND TUBING IN THOUSANDS OF BTU'S PER HOUR OF NATURAL GAS FOR GAS PRESSURES OF 0.5 PSIG OR LESS AND A MAXIMUM PRESSURE DROP OF ½ INCH WATER COLUMN

Iron pipe sizes—Length in feet											Tubing—Length in feet										
I.D.	10	20	30	40	50	60	70	80	90	100	O.D.	10	20	30	40	50	60	70	80	90	100
¼″	43	29	24	20	18	16	15	14	13	12	⅜″	27	18	15	13	11	10	9	9	8	8
⅜″	95	65	52	45	40	36	33	31	29	27	½″	56	38	31	26	23	21	19	18	17	16
½″	175	120	97	82	73	66	61	57	53	50	⅝″	113	78	62	53	47	43	39	37	34	33
¾″	360	250	200	170	151	138	125	118	110	103	¾″	197	136	109	93	83	75	69	64	60	57
1″	680	465	375	320	285	260	240	220	215	195	⅞″	280	193	155	132	117	106	98	91	85	81

PART II [RESERVED]

(i) *Concealed joints.* Piping or tubing joints shall not be located in any floor, wall partition, or similar concealed construction space.

(j) *Gas supply connections.* When gas appliances are installed, at least one gas supply connection shall be provided on each home. The connection shall not be located beneath an exit door. Where more than one connection is provided, the piping system shall be sized to provide adequate capacity from each supply connection.

(k) *Identification of gas supply connections.* Each manufactured home shall have permanently affixed to the exterior skin at or near each gas supply connection or the end of the pipe, a tag of 3 inches by 1¾ inches minimum size, made of etched, metal-stamped or embossed brass, stainless steel, anodized or alcalde aluminum not less than 0.020 inch thick, or other approved material (e.g., 0.005 inch plastic laminates), which reads as follows. The connector capacity indicated on this tag shall be equal to or greater than the total Btuh rating of all intended gas appliances.

COMBINATION LP-GAS AND NATURAL GAS SYSTEM

This gas piping system is designed for use of either liquefied petroleum gas or natural gas.

NOTICE: BEFORE TURNING ON GAS BE CERTAIN APPLIANCES ARE DESIGNED FOR THE GAS CONNECTED AND ARE EQUIPPED WITH CORRECT ORIFICES. SECURELY CAP THIS INLET WHEN NOT CONNECTED FOR USE.

When connecting to lot outlet, use a listed gas supply connector for mobile homes rated at □ 100,000 Btuh or more; □ 250,000 Btuh or more.

Before turning on gas, make certain all gas connections have been made tight, all appliance valves are turned off, and any unconnected outlets are capped.

After turning on gas, test gas piping and connections to appliances for leakage with soapy water or bubble solution, and light all pilots.

The connector capacity indicated on this tag shall be equal to or greater than the total Btuh rating of all intended gas appliances.

(l) *LP-gas supply connectors.* (1) A listed LP-Gas flexible connection conforming to UL 569–1995, Pigtails and Flexible Hose Connectors for LP Gas, or equal must be supplied when LP-Gas cylinders(s) and regulator(s) are supplied.

(2) *Appliance connections.* All gas burning appliances shall be connected to the fuel piping. Materials as provided in § 3280.705(b) or listed appliance connectors shall be used. Listed appliance connectors when used shall not run through walls, floors, ceilings or partitions, except for cabinetry, and shall be 3 feet or less in length or 6 feet or less for cooking appliances. Connectors of aluminum shall not be used outdoors. A manufactured home containing a combination LP-natural-gas-system may be provided with a gas outlet to supply exterior appliances when installed in accordance with the following:

(i) No portion of the completed installation shall project beyond the wall of the manufactured home.

(ii) The outlet must be provided with an approved quick-disconnect device, which must be designed to provide a positive seal on the supply side of the gas system when the appliance is disconnected. A shutoff valve of the non-displaceable rotor type conforming to ANSI Z21.15–1997, Manually Operated Gas Valves, must be installed immediately upstream of the quick-disconnect device. The complete device must be provided as part of the original installation.

(iii) Protective caps or plugs for the ''quick-disconnect'' device, when disconnected, shall be permanently attached to the manufactured home adjacent to the device.

(iv) A tag shall be permanently attached to the outside of the exterior wall of the manufactured home as close as possible to the gas supply connection. The tag shall indicate the type of gas and the Btuh capacity of the outlet and shall be legibly inscribed as follows:

THIS OUTLET IS DESIGNED FOR USE WITH GAS PORTABLE APPLIANCES WHOSE TOTAL INPUT DO NOT EXCEED _____ BTUH. REPLACE PROTECTIVE COVERING OVER CONNECTOR WHEN NOT IN USE.

(3) *Valves.* A shutoff valve must be installed in the fuel piping at each appliance inside the manufactured home structure, upstream of the union or connector in addition to any valve on the appliance and so arranged to be accessible to permit servicing of the appliance and removal of its components. The shutoff valve must be located within 6 feet of any cooking appliance and within 3 feet of any other appliance. A shutoff valve may serve more than one appliance if located as required by this paragraph (3). The shutoff valve must be of the non-displaceable rotor type and conform to ANSI Z21.15–1997, Manually Operated Gas Valves.

(4) *Gas piping system openings.* All openings in the gas piping system shall be closed gas-tight with threaded pipe plugs or pipe caps.

(5) *Electrical ground.* Gas piping shall not be used for an electrical ground.

(6) *Couplings.* Pipe couplings and unions shall be used to join sections of threaded piping. Right and left nipples or couplings shall not be used.

(7) *Hangers and supports.* All gas piping shall be adequately supported by galvanized or equivalently protected metal straps or hangers at intervals of not more than 4 feet, except where adequate support and protection is provided by structural members. Solid-iron-pipe gas supply connection(s) shall be rigidly anchored to a structural member within 6 inches of the supply connection(s).

(8) *Testing for leakage.* (i) Before appliances are connected, piping systems shall stand a pressure of at least six inches mercury or three PSI gage for a period of not less than ten minutes without showing any drop in pressure. Pressure shall be measured with a mercury manometer or slope gage calibrated so as to be read in increments of not greater than one-tenth pound, or an equivalent device. The source of normal operating pressure shall be isolated before the pressure tests are made. Before a test is begun, the temperature of the ambient air and of the piping shall be approximately the same, and constant air temperature be maintained throughout the test.

(ii) After appliances are connected, the piping system shall be pressurized to not less than 10 inches nor more than 14 inches water column and the appliance connections tested for leakage with soapy water or bubble solution.

[40 FR 58752, Dec. 18, 1975, as amended at 42 FR 54383, Oct. 5, 1977. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 52 FR 4587, Feb. 12, 1987; 58 FR 55016, Oct. 25, 1993; 70 FR 72050, Nov. 30, 2005]

EFFECTIVE DATE NOTE: At 78 FR 73987, Dec. 9, 2013, § 3280.705 was amended as follows, effective June 6, 2014.

a. Add paragraph (b)(5);

b. Add Table to paragraph (d);

c. Revise paragraph (f)(1);

d. Revise paragraph (h); and

e. Remove the Table designated ''Part I'' and the reference to ''Part II [Reserved]''.

For the convenience of the user, the added and revised text is set forth as follows:

§ 3280.705 Gas piping systems.

* * * * *

(b) * * *

(5) Corrugated stainless steel tubing (CSST) systems must be listed and installed in accordance with ANSI/IAS LC–1–1997, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST) (incorporated by reference, see § 3280.4), and the requirements of this section.

* * * * *

(d) * * *

TABLE TO PARAGRAPH (d)—MAXIMUM CAPACITY OF DIFFERENT SIZES OF PIPE AND TUBING IN THOUSANDS OF BTU/HR OF NATURAL GAS FOR GAS PRESSURES OF 0.5 PSIG OR LESS, AND A MAXIMUM PRESSURE DROP OF ½ IN. WATER COLUMN

ID (in.)	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft
Iron Pipe Sizes—Length										
¼	43	29	24	20	18	16	15	14	13	12
⅜	95	65	52	45	40	36	33	31	29	27
½	175	120	97	82	73	66	61	57	53	50
¾	360	250	200	170	151	138	125	118	110	103
1	680	465	375	320	285	260	240	220	215	195

EHD[2]	ID (in.)	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft
Corrugated Stainless Steel Tubing—Length[1]											
13	3/8	31	21	17	14	13	12	11	10	10	9
15	3/8	42	30	24	20	18	16	15	14	13	12
18	1/2	79	56	45	39	36	33	30	28	27	25
19	1/2	91	64	52	45	40	36	35	32	31	29
23	3/4	155	111	92	80	72	65	60	58	55	52
25	3/4	184	132	108	93	84	77	71	66	62	60
30	1	317	222	180	156	138	126	116	108	103	97
31	1	368	258	209	180	161	147	135	127	120	113
37	1 1/4	598	426	350	304	273	250	231	217	205	195

OD (in.)	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft
Copper Tubing—Length										
1/4	27	18	15	13	11	10	9	9	8	8
3/8	56	38	31	26	23	21	19	18	17	16
1/2	113	78	62	53	47	43	39	37	34	33
3/4	197	136	109	93	83	75	69	64	60	57
1	280	193	155	132	117	106	98	91	85	81

[1] Includes losses for four 90-degree bends and two end fittings. Tubing runs with larger numbers of bend and/or fittings shall be increased by an equivalent length of tubing according to the following equation: $L = 1.3n$, where L is actual length (ft) of tubing and n is the number of additional fittings and/or bends.
[2] EHD (Equivalent Hydraulic Diameter)—A measure of the hydraulic efficiency between different tubing sizes.

* * * * *

(f) * * *

(1) Tubing joints shall be made with either a single or a double flare of 45 degrees in accordance with Flares For Tubing, SAE–J533b–1992 or with other listed vibration-resistant fittings, or joints may be brazed with material having a melting point exceeding 1,000 °F. Metallic ball sleeve compression-type tubing fittings shall not be used.

* * * * *

(h) *Concealed tubing.* (1) Copper tubing must not be run inside walls, floors, partitions, or roofs. Corrugated stainless steel tubing (CSST) may be run inside walls, floors, partitions, and roofs under the following conditions:

(i) The CSST is protected from accidental puncture by a steel strike barrier not less than 0.058 inch thick, or the barrier's equivalent, installed between the tubing and the finished wall and extending 4 inches beyond concealed penetrations of plates, firestops, and wall studs, or specified by the tubing manufacturer's instructions; and

(ii) The CSST is installed in single runs and is not rigidly secured.

(2) Where tubing passes through exterior walls, floors, partitions, or similar construction, the tubing must be protected by the use of weather-resistant grommets that snugly fit both the tubing and the hole through which the tubing passes, or protected as specified in the tubing manufacturer's instructions.

(3) Concealed joints: Piping or tubing joints must not be located in any wall, floor, partition, or similar concealed construction space.

* * * * *

§ 3280.706 Oil piping systems.

(a) *General.* The requirements of this section shall govern the installation of all liquid fuel piping attached to any manufactured home. None of the requirements listed in this section shall apply to the piping in the appliance(s).

(b) *Materials.* All materials used for the installation extension, alteration, or repair, of any oil piping systems shall be new and free from defects or internal obstructions. The system shall be made of materials having a melting point of not less than 1,450 F, except as provided in § 280.706(d) and (e). They shall consist of one or more of the materials described in § 3280.706(b) (1) through (4).

(1) Steel or wrought-iron pipe shall comply with ANSI B 36.10–1979, Welded and Seamless Wrought Steel Pipe. Threaded copper or brass pipe in iron pipe sizes may be used.

(2) Fittings for oil piping shall be wrought-iron, malleable iron, steel, or brass (containing not more than 75 percent copper).

(3) Copper tubing must be annealed type, Grade K or L conforming to the Standard Specification for Seamless Copper Water Tube, ASTM B88–93, or